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Microbial cellulase: An enzyme with a huge potential

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Cellulases are enzymes produced by microorganisms. It hydrolyses cellulose polysaccharide into its sugar subunits. Currently, cellulase has a huge global demand due to its potential application in a broad range of industries. The aim of the current study was to explore natural environment of Sri Lanka for efficient cellulase producing microorganisms and studying their potential applications. Aerobic microorganisms were isolated from soil and anaerobic microbial consortia were isolated from termite guts, rumen fluid and Winogradsky columns using anaerobic work chamber. The total cellulase enzyme activities of microbial isolates were determined. Based on that, the efficient cellulolytic isolates were selected. Ethanologenic yeasts also were isolated from fruits. The potential application of efficient cellulolytic microorganisms and their enzyme extracts in bioethanol production, dye removal from denim, Damping-off disease control in tomato and pre-treatment of sugarcane bagasse was evaluated. Several aerobic fungi were efficient in cellulolysis. Trichoderma sp, Aspergillus sp and Penicillium sp were the most efficient. The highest total cellulase activity recorded was 0.94 U/ml which was given by a Trichoderma isolate. Although isolating anaerobes was challenging, several cellulolytic consortia were isolated. The highest cellulase activity was 0.18 U/ml which was given by a consortium isolated from rumen fluid. That was lower than the aerobic cellulase production. The coculture of Trichoderma and Y3 yeast isolate was giving the highest ethanol percentage, 5.32%. Cellulases from Trichoderma, Penicillium and Aspergillus were also efficient in dye removal from denim. Trichoderma enzyme extract was also suppressing the growth of Damping-off causative agent Phytophthora. Furthermore, the combination of Aspergillus with Earliella scabrosa, which is a basidiomycete fungus, was efficient in sugarcane bagasse pre-treatment. The potential applications of cellulolytic microorganisms and their cellulase enzyme extracts in industrial processes are very diverse.

Keywords: cellulase, cellulolytic microbes, applications of cellulase